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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JOHN E. HAYES, ALBERT MAGNOTTA,
and NIGEL BARKSBY

Appeal 2016-001776
Application 11/546,882
Technology Center 1700

Before PETER F. KRATZ, CATHERINE Q. TIMM, and
JEFFREY T. SMITH, *Administrative Patent Judges*.

KRATZ, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal[1] under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1–5, 7–11, 13, 14, 16–19, and 21–29.[2] We have jurisdiction pursuant to 35 U.S.C. § 6.

Appellants' claimed invention is directed to an immiscible polyurethane composite formulation (composition) and a process for

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[1] Appellants identify Bayer MaterialScience LLC as the real party in interest (App. Br. 2).

[2] This is the second appeal involving the subject Application. In the first appeal (Appeal No. 2011-006400), the Patent Trial and Appeal Board (PTAB) rendered a Decision (March 05, 2013) affirming the Examiner's rejection of the then pending claims on appeal.

preparing a fiber reinforced polyurethane composite using such a formulation via pultrusion. According to Appellants (Spec. 1, ll. 13–18):

> Pultrusion is a manufacturing process for producing continuous lengths of fiber reinforced plastic ("FRP") structural shapes. Raw materials include a liquid resin mixture (containing resin, fillers and specialized additives) and reinforcing fibers. The process involves pulling these raw materials, rather than pushing as is the case in extrusion, through a heated steel forming die using a continuous pulling device.

The polyurethane-forming formulation of the composite includes a polyisocyanate component and an isocyanate reactive component that are immiscible. The latter component includes at least two isocyanate reactive compounds that are immiscible, including a polyol having a number averaged molecular weight of at least 1500.

Appellants disclose that "[t]he miscibility of [a] isocyanate-reactive component can be determined by allowing the compounds to rest unmixed after the component is made and see if the component becomes hazy or separates into layers" (Spec. 5, ll. 12–14). Furthermore, Appellants disclose that "miscibility of the isocyanate-reactive component with the polyisocyanate can be determined by mixing the isocyanate-reactive component with the polyisocyanate component and determining the time for the mixture to [become] clear" (Spec. 5, ll. 14–17).

According to Appellants, they "have found that isocyanate-reactive mixtures that 1) are hazy or separate on standing; and/or 2) take a long time to clear process better" (Spec. 5, ll. 22–24).

Claims 1, 7, and 14 are illustrative and reproduced below:

1. A reaction system for the preparation of a fiber reinforced composite by a pultrusion process comprising:
continuous fiber reinforcing material; and
an immiscible polyurethane-forming formulation which undergoes essentially no polymerization under injection conditions in the pultrusion process comprising

a polyisocyanate component containing at least one polyisocyanate, and an isocyanate-reactive component containing at least two isocyanate-reactive compounds that are immiscible and that comprises a polyol having a number averaged molecular weight of at least 1,500, and wherein the polyisocyanate component and the isocyanate-reactive component are immiscible.

7. A pultrusion process for preparing a fiber reinforced polyurethane composite, the process comprising:

continuously pulling a roving or tow of continuous fiber reinforcing material

successively through an impregnation chamber and a die;
continuously feeding an immiscible polyurethane formulation to the impregnation chamber, wherein the polyurethane formulation comprises a polyisocyanate component containing at least one polyisocyanate and an isocyanate-reactive component containing at least two isocyanate-reactive compound that are immiscible with each other and that comprises a polyol having a number averaged molecular weight of at least 1,500, and
wherein the polyisocyanate component and the isocyanate-reactive component are immiscible;
contacting the fiber reinforcing material with the formulation in the impregnation chamber such that substantially complete wetting of the material by the formulation occurs;
directing the fiber reinforcing material through a die heated to reaction temperature to form a solid composite; and
drawing the composite from the die,

wherein conditions in the impregnation chamber are such that substantially no polymerization takes place.

14. In a process for preparing a fiber reinforced polyurethane composite by pultrusion, the improvement comprising including a phase separated polyurethane formulation composed of at least one isocyanate

which is immiscible with an isocyanate-reactive component that includes at least two polyols which polyols are immiscible with each other which undergoes essentially no polymerization under injection conditions in the pultrusion process, and

wherein the isocyanate-reactive component comprises a polyol having a number averaged molecular weight of at least 1,500.

The Examiner relies on the following prior art references as evidence in rejecting the appealed claims:

Ishida	US 5,294,461	Mar. 15, 1994
Joshi et al.	US 2004/0106726 A1	June 3, 2004 ("Joshi")
Brown et al.	US 2007/0113983 A1	May 24, 2007 ("Brown")

The Examiner maintains the following grounds of rejection:

1. Claims 1–5 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Joshi or, in the alternative, under 35 U.S.C. § 103(a) as being unpatentable over Joshi with or without Brown.

2. Claims 1–5, 7–11, 13, 14, 16–19, and 21–29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Joshi in view of Ishida or, in the alternative, over Joshi in view of Brown and Ishida.[3]

We affirm the stated anticipation and obviousness rejections based on the fact findings made by the Examiner and for substantially the reasons as set forth by the Examiner (Ans. 2–16; Final Act. 2–11). We offer the following for emphasis.

Rejections 1

[3] We list the Examiner's three separately discussed rejections as one because each rejection relies on the same evidentiary basis. Appellants list the Examiner's three rejections as Rejections B and C (App. Br. 7).

Concerning the Examiner's anticipation rejection of claims 1–5 over Joshi and the Examiner's obviousness rejection of claims 1–5 over Joshi in view of Brown, Appellants argue the rejected claims together as a group with respect to each of these stated rejections. We select claim 1 as representative. We affirm the stated rejections. Our reasoning follows.

Appellants argue that the teachings of Joshi fall short of establishing anticipation of the claim 1 subject matter because Joshi teaches that homogeneity of the polyurethane forming system is "highly desirable" and Joshi does not disclose the formation of separated solids prior to entering the first curing zone of the pultrusion setup (App. Br. 8–10; Joshi, col. 19, ll. 8–11). Thus, Appellants contend that the teachings of Joshi, including Example 3, do not teach all of the features necessary to establish "immiscibility" of the polyurethane-forming formulation, as required by Appellants' claim 1 (App. Br. 9).

However, Appellants disclose that "miscibility of the isocyanate-reactive component with the polyisocyanate can be determined by mixing the isocyanate-reactive component with the polyisocyanate component and determining the time for the mixture to [become] clear" (Spec. 5, ll. 14–17).

According to Appellants, they "have found that isocyanate-reactive mixtures that 1) are hazy or separate on standing; and/or 2) take a long time to clear process better" (Spec. 5, ll. 22–24). Appellants do not disclose an upper limit for the amount of time that they consider to be too "long time" a time for the mixture to clear.

The Examiner finds that Joshi discloses "a reaction system for the preparation of a fiber reinforced composite by a pultrusion process comprising a continuous fiber reinforcing material (¶0084) and a

polyurethane forming formulation" wherein the formulation includes "a polyisocyanate reactive component containing at least polyisocyanate (¶0065) and a isocyanate reactive component containing at least two isocyanate reactive compounds, one of which has a number average molecular weight of greater than 1,500 (¶0043)" (Ans. 3). While the Examiner recognizes that "Joshi et al desires the reaction mixture to cure homogenously," the Examiner finds that Joshi's "curing conditions are at high temperature (175 °C) with mixing (¶0099-0116)" and Appellants' "specification teaches the [claimed] immiscibility [] being measured at room temperature without mixing (5:12-23)" (Ans. 4). Thus, while the Examiner finds that Joshi does not teach a formulation where the "isocyanate reactive compounds are [explicitly described as] immiscible" under the curing conditions of Joshi (Ans. 3), the Examiner ultimately finds that "the teaching of Joshi et al. regarding homogenous cure does not establish that the components [of Joshi] are [not] immiscible under the conditions prescribed by [Appellants' claims and] the original specification" (Ans. 4).

Also, the Examiner makes additional determinations concerning the correspondence of the formulations described by Joshi and those disclosed by Appellants, including formulations without a chain extender or crosslinking agent, such as provided for by Joshi in Example 13 (Ans. 3). Thus, the Examiner has furnished a foundation for the Examiner's additional finding that Joshi teaches a polyurethane forming formulation comprising "all the features that lead to immiscibility" as measured by Appellants' immiscibility test, including components similar to those taught by Appellants in the subject Specification for their formulation, such that "the polyurethane forming formulation [taught by Joshi] would inherently be

immiscible" as required by representative claim 1 and Appellants' disclosed room temperature immiscibility test (Ans. 3–4).

Consequently, we concur with the Examiner that Appellants' argument with respect to Joshi's Example 3 formulation and the presence of a low molecular weight chain extender therein is not persuasive of harmful error in the Examiner's anticipation rejection premised on a reasonable expectation of immiscibility for pultrusion formulations of Joshi that the Examiner finds to substantially correspond to those disclosed by Appellants and that do not include the optional chain extender, such as the applied Example 13 formulation of Joshi (Ans. 13–14; App. Br. 8–9).

Moreover, Appellants argue that the claimed polyurethane-forming formulation does not significantly polymerize prior to undergoing curing in the pultrusion line curing zone whereas the formulation of Joshi cures homogenously prior to entering the first curing zone (App. Br. 10; Joshi, col. 19, ll. 8–11).

The latter argument is not persuasive of reversible error in the Examiner's anticipation rejection of representative claim 1 because representative claim 1 is drawn to a pultrusion reaction system composition and the pultrusion reaction "injection conditions" and timing of the polymerization are process conditions and intended use limitations that are not limiting as to the claimed pultrusion reaction system composition (*see* Ans. 14). In addition and as determined by the Examiner, "Joshi et al. teaches a substantially similar reaction system, and teaches that the polymerization can be controlled by reducing the temperature"; thus, "the system of Joshi et al. would be capable of undergoing essentially no

polymerization under [certain] injection conditions" (Ans. 14–15; Joshi ¶ 91).

Furthermore, Appellants have not proffered an upper limit for the amount of polymerization reaction that the claim term "essentially no polymerization under injection conditions" encompass. Appellants state that "[t]he conditions in the injection die are such that little, or more preferably no polymerization of the immiscible polyurethane formulation will occur" (Spec. 8, ll. 26–28). Consequently, the qualifiers "essentially" seems to be measured by the term "little," leaving the claims open to a broadest reasonable construction when read in light of the subject Specification that would permit some polymerization in the injection die.

In light of the above and for reasons set forth by the Examiner, Appellants' arguments fail to show reversible error in the Examiner's anticipation rejection of representative claim 1 over Joshi.

Correspondingly, Appellants' argument against the Examiner's anticipation rejection of claim 1 over Joshi exposes no reversible error in the Examiner's alternative obviousness rejection of claim 1 over Joshi with or without Brown. In this regard, there is no deficiency in the Examiner's application of Joshi to representative claim 1 that needs curing by Brown. Consequently, Appellants' argument that "Brown does nothing to overcome the foregoing deficiencies of Joshi" is unavailing (App. Br. 10).

Moreover, even if the teachings Joshi alone were considered, *arguendo*, to lack an implicit teaching of a pultrusion formulation that includes immiscible components, Brown augments the teachings of Joshi by expressly teaching the use of a pultrusion formulation with an isocyanate component and a polyol component that are immiscible under conditions

prior to encountering the heat of the curing die and beginning to react (Brown ¶ 49).

As articulated by the Examiner under the obviousness alternative of the expressed rejection, an ordinarily skilled artisan would have been led to have used an immiscible formulation in Joshi, as an option, given the additional teachings of Brown and incentivized by the higher degree of impregnation and short gelled state curing time taught by Brown (Ans. 3–4; Brown ¶ 49).

In light of the Examiner's findings and determinations, Appellants' lack of motivation contention leveled at the Examiner's proposed combined teachings of Joshi and Brown under the Examiner's 35 U.S.C. § 103(a) alternative of Rejection 1 (App. Br. 10) carries no persuasive weight (Ans. 15).

As for Appellants' contention that the subject Specification Examples demonstrate surprising/unexpected results for the claimed pultrusion formulation as compared to miscible formulations, we observe that the reported lighter color for Examples 2 through 8 as compared to comparative Example 1 of Table 1 of the subject Specification does not present sufficient data to demonstrate a nexus between lighter color products and relative miscibility of the pultrusion formulations based on time to clear (Spec. 5, ll. 5–11, 17–19 (Table 1)). In this regard, we further observe that representative claim 1 is not limited to a pultrusion formulation that includes the specific components tested in Examples 2 through 8, as reported in Table 1.

It follows that we sustain Rejections 1.

Rejections 2

Concerning the Examiner's obviousness rejection of claims 1–5, 7–11, 13, 14, 16–19, and 21–29 under 35 U.S.C. § 103(a) as being unpatentable over Joshi in view of Ishida or, in the alternative, over Joshi in view of Brown and Ishida, Appellants argue the rejected claims 1–5, 21–23 together as a group (Group I) and rejected claims 7–11, 13, 14, 16–19, and 24–29 together as another group (Group II) with respect to each of these stated rejections. We select claim 1 and claim 7 as the representative claims for the respective groups of claims. We consider any separately addressed claims separately to the extent additional substantive argument is presented in the Appeal Brief.[4] We affirm the stated rejection for substantially the reasons set forth by the Examiner in the Answer. We offer the following for emphasis.

Group I

Appellants traverse the Examiner's obviousness Rejections 2 of representative claim 1 for substantially the reasons Appellants presented in contesting the Examiner's Rejections 1 (App. Br. 11). For reasons discussed above and by the Examiner in the Answer, such argument is not persuasive of reversible error by the Examiner in maintaining Rejections 2. Because we determined that there is no deficiency in the Examiner's anticipation rejection of claim 1 over Joshi or in the Examiner's obviousness rejection of

[4] Appellants identify claims 21, 22, 24, 25, 27, and 28 as being separately argued in the Reply Brief (p. 1). However, only dependent claims 21 and 22 are identified for separate additional argument in the Appeal Brief (App. Br. 12). Appellants have not shown good cause for why the new separate additional arguments were not presented in the Appeal Brief. Thus, we do not consider them. 37 C.F.R. §§ 41.37(c)(1)(iv) and 41.41 (2015).

claim 1 over Joshi taken with Brown, Appellants' contention that Ishida does not cure the deficiencies therein is unavailing.

Moreover and to the extent that Appellants argue that Ishida's teachings are contrary to Joshi's teachings leaving one of ordinary skill in the art with no motivation to modify Joshi with Ishida with or without Brown in maintaining the rejection of representative claim 1, such argument is unpersuasive at the outset (App. Br. 11–12). This is because Ishida is not necessary to the obviousness rejection, as discussed above.

In addition and for reasons expressed by the Examiner, we do not find Appellants' lack of motivation argument persuasive (Ans. 15–16).

Concerning Appellants' remarks with respect to Example 3 of Joshi and dependent claims 21 and 22 (App. Br. 12), Appellants do not articulate why the Examiner's reliance on Example 13 of Joshi together with the other disclosures of Joshi teaching the use of polyols having a molecular weight within the range claimed (at least 1500), taken with or without the additional teachings of Ishida and/or Brown and Ishida, would fail to suggest the subject matter of the these dependent claims (Ans. 6–7; Joshi ¶ 43). Consequently, this argument has no merit in identifying reversible error in the Examiner's obviousness rejection of claim 21 and/or claim 22.

Group II

Concerning representative method claim 7, Appellants apply the same arguments advanced above (App. Br. 12–13), which we determined to be unpersuasive for the relevant reasons as addressed above as they apply, *mutatis mutandis*, to representative claim 7 and for the reasons set forth by the Examiner (Ans. 8–16).

Consequently for the fact findings, reasons, and rebuttal set forth in the Examiner's Answer, we are not persuaded of substantive error in the Examiner's obviousness rejections (Rejections 2) by the arguments presented by Appellants in the Appeal Brief.

It follows that we shall sustain the Examiner's Rejections 2.

ORDER

The Examiner's decision to reject the appealed claims is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED